GFE for an International Space Station (ISS) Attached Payload for the Full-truss Site

Presentation to MIDEX AO Pre-Proposal Conference

August 10, 2001

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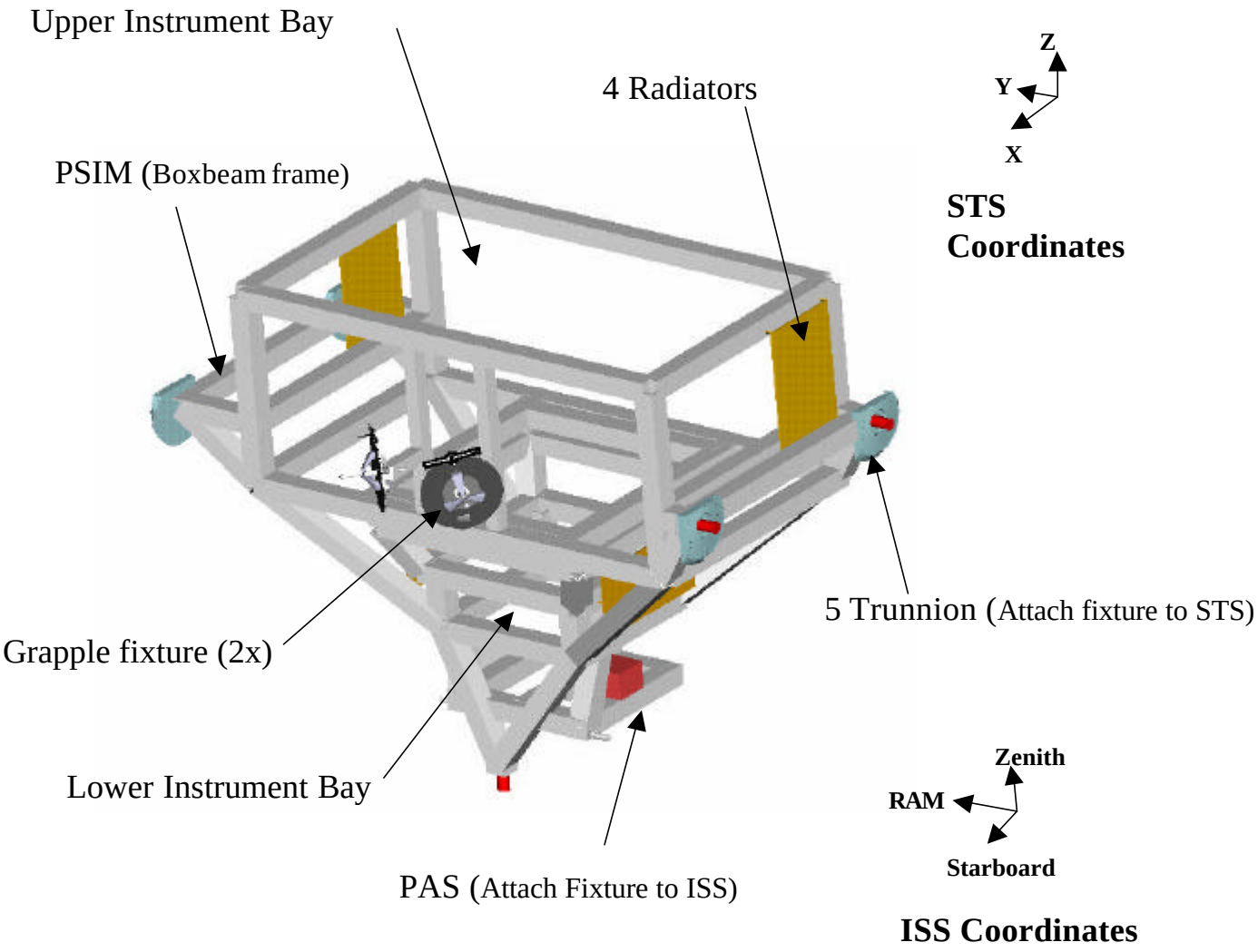
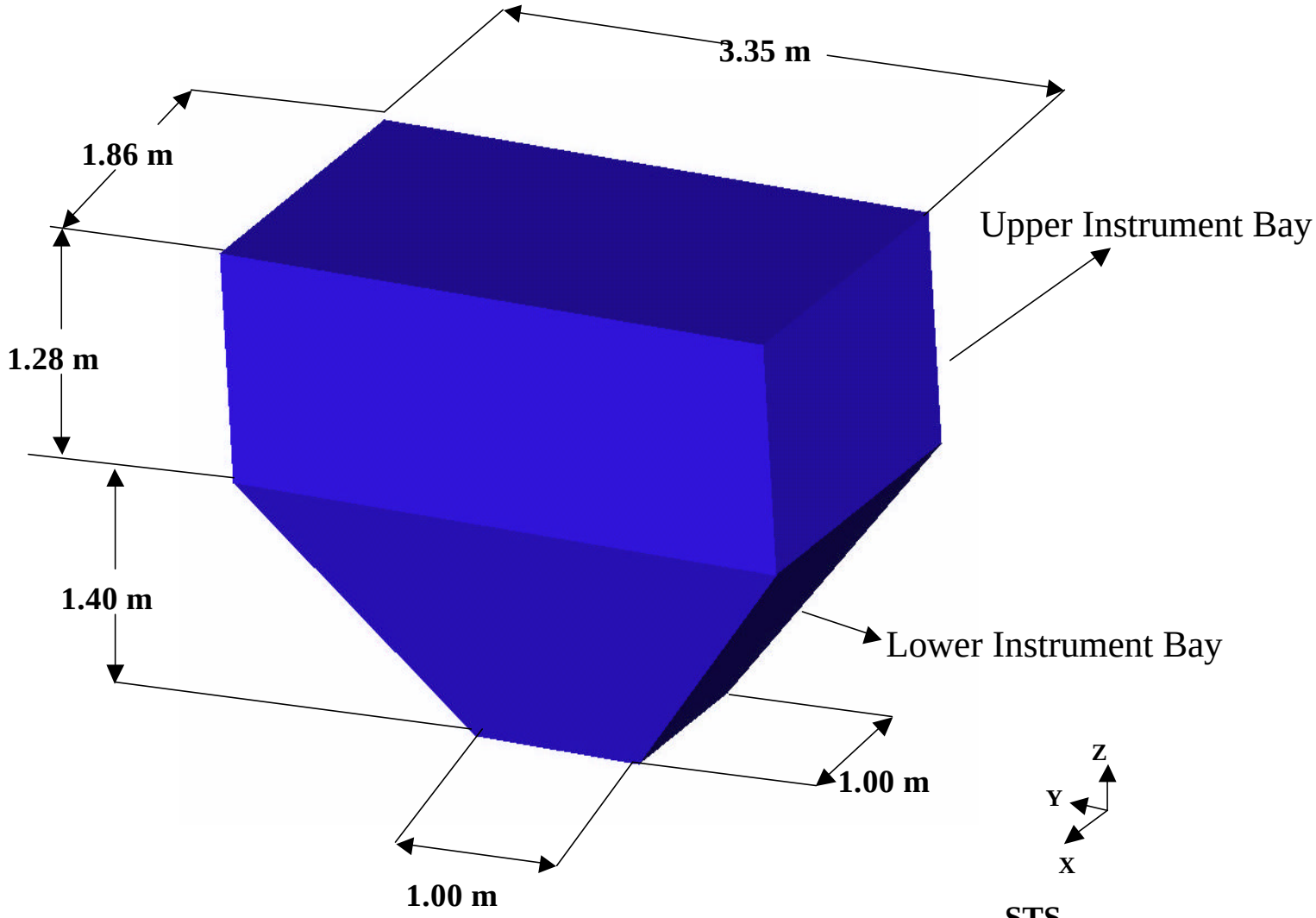
GFE (Government Furnished Equipment)

- GFE for an ISS Attached Payload for the full-truss site consists of the Payload Support and Interface Module (PSIM) and NASA-provided project services
- GFE implementation will be managed by NASA-Goddard Space Flight Center (GSFC)
  - Project office will be at GSFC
  - Mission integration and test will be performed at GSFC (Greenbelt, MD)

Payload Support and Interface Module (PSIM)



PSIM Instrument Envelope



PSIM Design Features

- Provides interfaces for the science instrument package on the ISS external attach site
  - Designed and configured to utilize the ISS resources
  - Starboard Upper Inboard Site: S3
- Serves as a carrier in the Shuttle cargo-bay during launch and landing
- Designed for on-orbit life of 4 years
- EVA and EVR compatible

PSIM Design Features - continued

- Provides structural support to science instruments on the ISS full-truss attach site
  - Accommodate instrument mass of 3560kg (launch limit mass of 4446kg) with C.G. constraints
  - Instrument volume envelope constraints
  - Science instruments attach to the PSIM structures
- PSIM structure extends and attaches to the trunnions in the Shuttle cargo-bay
- Bridges between ISS and instruments for power and data

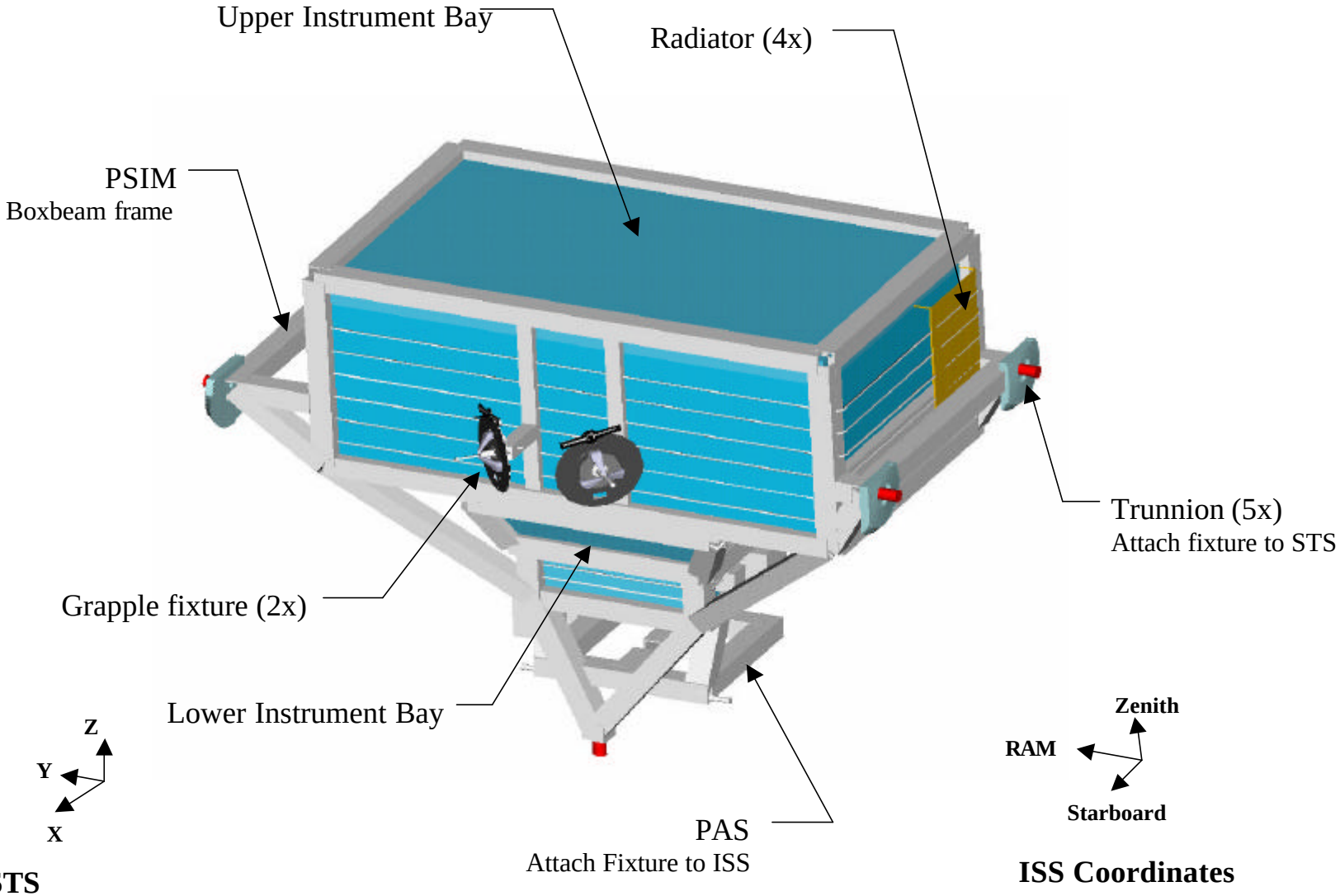
PSIM Design Features - continued

- Power System
  - Provides filtered 120VDC to instruments
  - 650W (orbit avg.) available during normal mode
  - 500W available during “keep-alive” mode: only safety and mission critical systems will be powered
  - Payload power on in the Shuttle cargo bay for thermal system only
  - Payload power off during on-orbit transfer
- Command and Data Handling System
  - MIL-STD-1553B between ISS and PSIM, PSIM and instruments
  - Solid State Recorder : 5 GBytes
  - Data Rate: 350 kbps, CCSDS packet level protocols

PSIM Features - continued

- PSIM Thermal System
  - Assumes 500W “Keep-Alive” mode
  - Provides passive radiator for instruments: instrument heat pipes can be attached for instrument heat dissipation
- ISS and Shuttle Interface Hardware
  - Flight Releasable Grapple Fixture (FRGF)
  - Power Video Grapple Fixture (PVGF)
  - Berthing Cue System (BCS)
  - Umbilical Mechanism Assembly (UMA)
  - EVA Handrails: Total 9 Handrails\
  - Remotely Operated Electrical umbilical (ROEU)
  - Payload Attach System (PAS)

Integrated ISS Attached Payload: PSIM & Instruments



NASA-Provided Project Services

- Mission System verification and validation
  - Requirements tracking and verification
  - Science instrument integration to the PSIM
  - ISS and Shuttle interface hardware integration to PSIM
  - System Test and Verification
- Environmental Testing
  - Mass properties
  - Structural Loads
  - Thermal Vacuum/Balance
  - EMI/EMC
  - Acoustic, Shock, Random Vibration

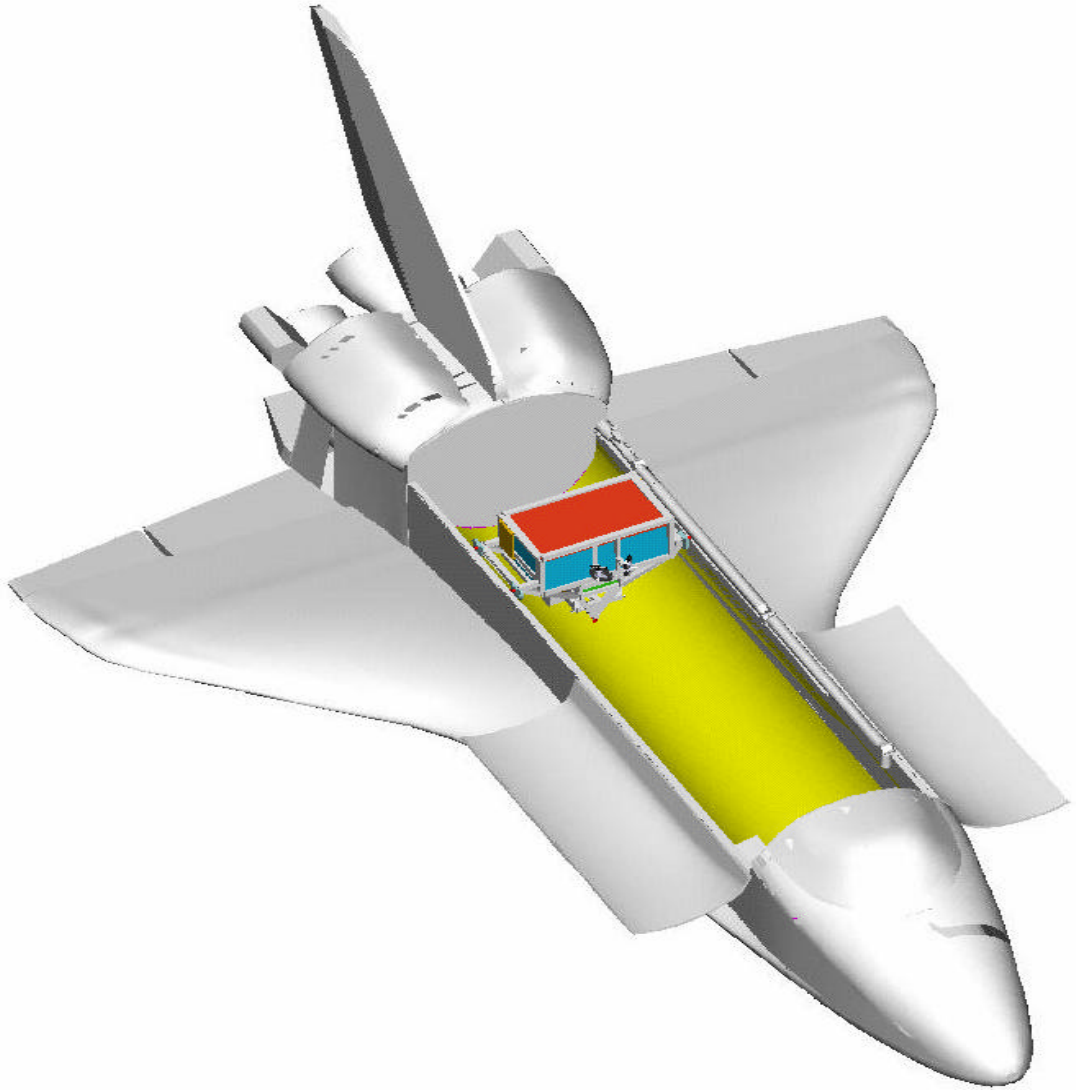
NASA-Provided Project Services - continued

- Shuttle and ISS Support Services
  - Management and technical reviews: CIR FRR, PSRP, etc.
  - Documentation: PIP, ICD, Annexes, etc.
  - Payload Safety Compliance Data
  - Engineering Analyses: Coupled Loads Analysis, etc.
  - Cargo integration, launch support, IOC
  - ISS and Shuttle interface verification
  - NBL Mockups
  - Post-landing processing

NASA-Provided Project Services - continued

- GSFC project will provide the appropriate ground support equipment (GSE) for system level test, verification, and integration activities
  - Payload lift sling
  - Handling fixtures
  - Tansporter/Shipping container
  - Data and Monitoring equipment for performance testing
  - ISS/Shuttle Simulators
- GSFC provided GSE will conform to KHB 1700.7B

Attached Payload in the Shuttle cargo-bay



International Space Station: payload on S3